New Junior Faculty Bolster the COE

The UC Santa Barbara College of Engineering has hired the following seven new faculty members. Four have started during the 2022-'23 academic year, two will begin this summer, and one will start next fall.

Ananya Renuka Balakrishna
Materials (2022-'23)

Ananya Renuka Balakrisha received her PhD from the University of Oxford, where she wrote her dissertation on solid mechanics and materials engineering. Specifically, she says, "I developed a mathematical model to predict how microstructures form and evolve in ferroelectric materials and how such patterns govern macroscopic material properties, such as deformation, memory storage, and energy-harvesting capabilities."

She is building on that line of inquiry at UCSB. Her group's research is centered around the observation that microstructures can have dramatic effects on a material's physical properties. She notes, "We use the insights we gain to guide the discovery and design of materials having enhanced properties." To that end, her team is currently working on intercalation materials that are used as electrodes in lithium batteries, designing microstructures in multi-functional materials — such as ferromagnets, which have a magnetization dipole in their crystals and exhibit unique magneto-elastic properties important for energy-harvesting applications — and is newly branching out to understand microstructural evolution in light-interactive molecular crystals.

In describing why she was drawn to UCSB, Balakrishna says, "The collaborative environment both within the Materials Department and across campus was an instant attraction to me. The department is home to several important collaborative hubs, such as the MRL [Materials Research Lab] and CNSI [California NanoSystems Institute], which foster interdisciplinary research and are known for their cutting-edge facilities and education programs. As someone with a background in solid mechanics and computational materials, I am thrilled to be a part of such a vibrant research community, and I look forward to engaging with and learning from my colleagues in the years ahead."

Haewon Jeong
Electrical and Computer Engineering; Computer Science Affiliation (2022-'23)

Haewon Jeong says that her on-campus interview experience had a lot to do with her choosing to come to UC Santa Barbara. "The amazing colleagues I met during the interview process were definitely the biggest draw," one that was complemented, she says, by "the idyllic beauty of Santa Barbara. When I drove through Henley Gate for the first time, I couldn't believe how beautiful the campus was. It still captivates me, and every morning when I drive in, I feel grateful to work here."

Jeong earned her PhD at Carnegie Mellon University and wrote her dissertation on research she conducted at the intersection of information theory, high-performance computing, and machine learning (ML).

"I care about the reliability of large-scale machine learning algorithms," she says. "ChatGPT (see page 17) blew our minds and swept the world so quickly. Recent ML technologies that generate realistic and creative art with simple text commands seem to enable anyone to be an 'artist.' These fascinating ML tools are becoming part of our life so quickly, but their reliability has not yet been thoroughly tested. Is society ready for them? Oftentimes, the algorithms inherit societal stereotypes and discriminate against marginalized minority groups, or they inadvertently leak private information.

"At the same time, the inner workings of these large-scale ML models are so opaque that it is hard to tell where it went wrong," Jeong adds. "My research is aimed at tackling these problems and designing more reliable ML algorithms that can perform better in terms of fairness, privacy, and accountability. I use tools from information theory and statistics to provide theoretical understanding of algorithms and also provable guarantees of desired properties, such as fairness to all groups. I also closely collaborate with systems researchers to build hardware that is more reliable for running large-scale algorithms.

Sukhun Kang
Technology Management (summer '23)

Sukhun Kang will join the Technology Management Department as an assistant professor in fall, after completing his PhD this summer at the London Business School (LBS) in the United Kingdom. His area of expertise is strategy and entrepreneurship, with a focus on the biopharmaceutical and high-tech sectors.

Kang says that "many impressive aspects" of the College of Engineering attracted him to UCSB, but that he was especially drawn to "the genuine enthusiasm and passion that the faculty and staff in the TM Department displayed for their work. This level of excitement is not something I have seen at every university or department, and it was very appealing to me."

Further, he adds, "I was attracted to the emphasis on interdisciplinary research, which is highly valued at both the college and in the department. Technology management is not just about the technology itself, but also the companies and people behind it, and I am excited to explore how managing technology can have a broader impact on society."

Kang entered the PhD program at LBS intending to pursue research on entrepreneurship and venture capital. But when an immediate family member was diagnosed with cancer, he began looking through medical journal papers and following news of pharmaceutical companies to try to find what might be the best available treatment. During that process, he recalls, "I realized that strategic decision-making in the oncology industry was a complex and unconventional area to explore, given the various tensions involved." As a result, he adds, "My current research is focused on understanding how companies in this industry can better manage technology and innovation to improve access to novel drugs for patients."

Finally, he notes, "I have a deep interest in technology, innovation, and entrepreneurship, and how they can benefit society at large. I would love to connect with others who share these passions, and I look forward to joining the vibrant community at UCSB."

Ousmane Kodio
Mechanical Engineering (summer '23)

Ousmane Kodio, who will join the UC Santa Barbara faculty in July, received his PhD in mathematics from the University of Oxford and is currently an instructor of applied mathematics at the Massachusetts Institute of Technology. He says that he was attracted to UCSB by "the collaborative research environment" and that he is "very excited to be joining the vibrant community at UCSB and interacting with brilliant and supportive colleagues."

Kodio conducts research at the interface of applied mathematics, theoretical physics, and biology, with the aim of gaining insights into physical, biological, or societal problems through the lens of mathematical modeling. He uses mathematical modeling in conjunction with experimentation and computational tools to analyze the formation of patterns in complex systems, such as the growth and forms of living matter, and the emergence of collective behavior in active systems.

Ziad Matni
Computer Science (2022-'23)

"Every day when I drive into campus toward Henley Gate, with that big blue ocean to my left, I have to remind myself that this is not a fantasy, that I do work here!" says assistant teaching professor Ziad Matni.

Beyond Henley Gate, he says, "The UCSB College of Engineering is a world-class organization, and I am thrilled to be part of it, working among some of the most accomplished people in their fields. I also thoroughly enjoy teaching computer science courses to eager, intelligent undergraduate students. Finally, the collaborative environment here has already enabled me to work on research with colleagues not only in Computer Science, but also in other fields where computational approaches are valued."

Matni received his PhD in the area of information science from Rutgers University in 2018, after earning a Master of Science in Electrical Engineering from the University of Southern California. He says that a teaching assistantship there "cemented my love for teaching and research," but he chose to work in the tech industry for about thirteen years before, he says, "deciding it was time to go back to academia."

Teaching occupies at least half of Matni's work, with the other half divided among research, mentorship, and service. "I've had an affinity for teaching since my own undergraduate days," he says. "I especially value the opportunity it provides to positively impact the lives of young people, and I relish the role of teacher and mentor and enjoy honing my skills and developing my teaching philosophy and practice. Teaching gives me great personal satisfaction."

A key factor in Matni's choice to return to academia, he says, is the opportunity it provides "to meet a large variety of people on a daily basis. I am also always looking to understand not just the technical domain of computers, but also their impact on people's daily lives and, indeed, on society at large."

Just as *Convergence* was going to press, we learned that at least four more new faculty in the College of Engineering — in bioengineering, chemical engineering, and computer science — will be joining the seven assistant professors profiled here. Stay tuned, because we'll be introducing you to them in the next issue of the magazine.

Daniel Oropeza
Materials (summer '23)

Daniel Oropeza says that he was attracted to UCSB by the collaborative culture he found here, which became evident through his interactions with faculty and students during his visits to campus. "It was clear that the faculty cared for and knew one another not only professionally, but also on a personal level," he says, "and that they take pride and find enjoyment in working together, which is reflected, ultimately, in the enhanced impact of their research."

In his own research, Oropeza focuses on probing the fundamentals of materials processing for aerospace and extreme environments, including platforms such as hypersonics, spacecraft, and renewable and conventional energy generation.

"We are exploring the fundamentals of additive manufacturing for metals and ceramics by developing custom testbeds through material synthesis and characterization, and post-process optimization," he explains. "We aim to understand how material feedstocks and processing parameters influence a material's microstructure and properties, which drive performance." He is particularly excited to pursue research on novel refractory and magnetic alloys processed via additive manufacturing, fundamentals for inkjet-based manufacturing, and the implementation of emerging machine-learning tools to optimize and automate manufacturing processes."

Oropeza earned his PhD at the Massachusetts Institute of Technology, and then spent two years as a postdoctoral researcher at NASA's Jet Propulsion Laboratory. "I'm very much looking forward to mentoring and teaching students as they grow during their professional journey, setting up a new lab to enhance the research capabilities of the department, and learning from my colleagues as we pursue new research opportunities," he says.

Yao Qin
Electrical and Computer Engineering (2022-'23)

Yao Qin earned her PhD and master's degrees in computer science and engineering at UC San Diego, and her BS in electrical engineering from Dalian University of Technology in China. Prior to arriving at UCSB, she spent nearly three years in New York as a research scientist for Google. She currently focuses her research on the subject of robustness in machine learning (ML). "For example," she says, "a self-driving car system can be thrown off by a mischievous adversary or might not work in unexpected weather conditions. My key research agenda is to design machine-learning algorithms to improve the models' robustness when they encounter unexpected scenarios."

Like so many faculty members who come to UCSB, Qin says, "I really love the collaborative environment and the active research energy in the department. I am looking forward to working with excellent students and faculty to develop a deep understanding of machine-learning models that will allow us to improve their robustness."

That, she says, includes defending against not only adversaries that attack machine-learning models, but also out-of-distribution generalization, both of which require ML models to function well under unobserved scenarios. "I am also highly interested in applying ML models to help patients who have diabetes to control glucose levels by predicting the required amount of insulin," she notes.

Qin says that she finds particular enjoyment in "mentoring students and helping to shape how the new generation thinks about computer science. It is rewarding to witness the growth of students and to develop my own knowledge with them."